

In the first line of p. 22 "position" is obviously a misprint for "composition," and there are a considerable number of such slips throughout the work.

A fairly full "contents list" is given, but the book would have been more useful if a comprehensive index had been provided.

T. A. H.

THE WORKS OF C. F. GAUSS.

Carl Friedrich Gauss Werke. Siebenter Band. Herausgegeben von der Kön. Gesellschaft der Wissenschaften zu Göttingen. Pp. 650. (Leipzig: B. G. Teubner, 1906.) Price 30 marks.

THIS volume contains a reprint of Gauss's principal astronomical work, the "Theoria Motus Corporum Coelestium," and his unpublished researches on planetary perturbations and on the lunar theory. In 1801 the late Prof. Schering brought out a "volume vii." without the cooperation of the Göttingen Academy of Science, containing the "Theoria Motus" and some notes from Gauss's papers; but for the sake of uniformity the academy considered it desirable to include the "Theoria" in the present volume, which has been edited by Prof. Brendel, of Göttingen.

A careful revision of the original edition of 1809 brought a few corrections to light, and a re-computation of the examples with modern tables of logarithms revealed a number of errors of one or two units of the seventh decimal (caused probably by the absence of decimals in the proportional parts of the old tables) which sometimes gave rise to greater errors in the course of the computation. A list of these corrections is given. Some notes found in Gauss's own copy of the book are added in footnotes. Next follow various notes on elliptic and parabolic motion, partly already published, partly extracted from letters and note-books. Of these the most important is a table for computing the true anomaly in a parabolic orbit; it was to have formed part of a supplement to the "Theoria Motus," dealing with the orbits of comets, which never was written.

The discovery of the first of the minor planets, Ceres, had obliged Gauss to work out a general method of computing an elliptic orbit. The next step was to determine the perturbations of the motion of Ceres and Pallas, which, particularly in the case of the latter, necessitated new methods owing to the great eccentricity and inclination; and on this work Gauss spent a great deal of time in the years 1802 to 1817. In 1805 he worked out a new method of computing the general perturbations by the variation of the elements, but he never published anything on the subject. The method is essentially the same as that proposed by Hansen in 1843 in his paper on absolute perturbations in orbits of any eccentricity and inclination.

The present volume first gives letters and computations on Ceres, after which follow 200 pages devoted to Pallas. Special perturbations by Jupiter for the years 1803-1811 were computed in 1810 and 1811, first for intervals of fifty days, after which the work was repeated with periods of 500 days, the

elements for each period being taken from the first computation. The memoir on the theory of general perturbations was written in French, about the year 1815, apparently in answer to a prize question of the Paris Academy, but never finished. In 1811 Gauss began the immense labour of computing the action of Jupiter on Pallas, and finally, with the aid of Encke and Westphal, completed the work by the preparation of tables. The perturbations by Saturn were computed by Nicolai, and this work is preserved at the Heidelberg Observatory; it has naturally not been included in the present volume, but hopes are held out that it may be published elsewhere. Finally, the last part of the whole work, the action of Mars, was taken in hand, but owing to the press of other work it was never completed. It is much to be regretted that this fine piece of work, involving an enormous amount of computation, has been unknown until now, and that not even so interesting a result as the increase of the assumed mass of Jupiter was published. Already in 1814 Gauss found from the first nine oppositions of Pallas that Laplace's value, 1:1067.09, should be increased to 1:1042.86, a result which differs but little from the most recent determinations. If known to Encke, this correction of the mass would have prevented the errors of 5' in the computed geocentric places in 1834, caused by the near approach to Jupiter in 1832 (*Astr. Nachr.*, No. 332). Needless to say, the remarkable commensurability of the mean motions of Jupiter and Pallas was noticed by Gauss at an early date.

It appears from letters written to Hansen and Bessel in 1843 that Gauss bitterly regretted having laid this great work aside. Thanks to the skilful editorship of Prof. Brendel, whose task of arranging and interpreting a vast mass of papers must have been a very difficult one, the work is now accessible in a clear and convenient form, and it is to be hoped that some competent hand will complete it.

Lastly, the volume contains the beginning of a lunar theory, dating from the second half of 1801, but soon abandoned, probably because vol. iii. of Laplace's "Mécanique Céleste" came out in the following year, and seemed to make work on the motion of the moon unnecessary at that moment. The form in which the perturbations are given is similar to that of Plana (1832).

Vols. viii. and ix. of the collected works of Gauss have already appeared. A tenth and concluding volume is announced, which is to include a general index.

J. L. E. D.

NATURE AND FLORAL DESIGN.

Flowers and Plants for Designers and Schools. By Henry Irving and E. F. Strange. Pp. 95. (London: Hodder and Stoughton, 1907.) Price 10s. 6d. net.

IF designers could be produced by the study of books upon plant form there ought to be a large and flourishing crop of them, since so many elaborate works have appeared on this subject addressed to the supposed needs of such artists.

Every designer of any originality, however, feels the necessity of providing his own raw material, and what is suggestive and valuable to one may by no means prove equally so to another. The designer's best reference library is, of course, Nature; but Nature is always changing her dress, and her wealth of floral pattern is transformed with each season, so that unless we presuppose good opportunities combined with immense industry on the part of the artist, he must occasionally run short of working notes, and may be glad of the help of a herbal or a book which will give him the essential facts of the form, growth, general appearance, and structure of particular plants and flowers with which he is not familiar.

Such a practical aid and friend in need may be found in the admirable series of photographs from nature by Mr. Henry Irving and the valuable notes by Mr. E. F. Strange which constitute the volume before us.

The latter contributes a well-informed and interesting introduction to the book, as well as a series of notes upon the plants figured, which show his historic knowledge as well as his artistic sympathies.

While quite of the opinion he expresses as to the value of the study of the human form for *all* designers, it appears to be quite possible to attain great skill in purely floral draughtsmanship and design without any corresponding power over the human figure. Mr. Strange, too, hardly seems to appreciate, perhaps, the value of practice with a *firm point*—the severest test of draughtsmanship—the power of clear definition and definite expression being most necessary in all kinds of working designs intended to be carried out by some process of handicraft or manufacture. He is also a little severe upon what he describes as “brush-work”—the power of clear definition of form in the mass by means of brush and colour being also essential to a floral-designer's work, and needing much practice to gain facility and sureness of touch. The dexterity and directness of the method of Japanese artists have taught us much in this way.

Mr. Strange gives an admirable *résumé* of the treatment of plant form in the history of decorative art, and in speaking of the utility of such examples of plant form as are given in Mr. Irving's plates, he very pertinently remarks upon the beneficial effect upon a student or designer having to make their notes and drawings direct from nature or from photographs such as these, “uninfluenced by the versions, however admirable, of others.”

If a designer cannot refer directly to nature, photographs are next best for most purposes, that is to say, for all superficial facts about a plant which can be disclosed without colour.

Mr. Henry Irving has made an interesting and judicious selection of plants and flowers likely to be useful to designers of all kinds, and he has been successful in presenting them by photography in a clear and tasteful way, often usefully silhouetting the stems and leaves against a light plain background, and giving the scale, and in some cases showing the seed vessels and the root. The plate

of the tulip tree gives a singularly complete exposition of the characteristics of the tree—stem, leaf, bud, and full flower being given, and, moreover, quite decoratively spaced. Among the most successful plates, perhaps, may be named the wild rose, the yellow iris, the wood sorrel, the lily of the valley, the thistle, the teasle, and the catkins of the hazel.

More of the lily tribe might have been given perhaps with advantage, seeing that the structure is so beautiful and well defined, and it is the structure of plants and flowers above all that a designer needs to understand. Altogether the book may be heartily recommended to students and practical designers, and, indeed, to all interested in the beauty of plants and flowers.

WALTER CRANE.

SOME RECENT PHILOSOPHICAL WORKS.

- (1) *Proceedings of the Aristotelian Society*. New Series. Vol. vi. Pp. 402. (London: Williams and Norgate, 1906.) Price 10s. 6d. net.
- (2) *René Descartes' Philosophische Werke*. Erste Abteilung (Fortsetzung). Übersetzt und herausgegeben von Dr. Artur Buchenau. Pp. xviii+149. (Leipzig: Dürr'sche Buchhandlung, 1906.) Price 1.80 marks.
- (3) *Hellers Philosophie*. Herausgegeben von Horst Stephan. Pp. xlv+309. (Leipzig: Dürr'schen Buchhandlung, 1906.) Price 3.60 marks.
- (4) *The International Scientific Series. The Mind and the Brain*. By Alfred Binet. (The authorised translation of “L'Âme et le Corps.”) Pp. xii+280. (London: Kegan Paul, Trench, Trübner and Co., Ltd., 1907.) Price 5s.
- (5) *Essay on the Creative Imagination*. By Th. Ribot. (Translated from the French by A. H. N. Baron.) Pp. xix+370. (London: Kegan Paul, Trench, Trübner and Co., Ltd., 1906.) Price 7s. 6d. net.
- (6) *Structure and Growth of the Mind*. By W. Mitchell. Pp. xxxv+512. (London: Macmillan and Co., Ltd., 1907.) Price 10s. net.

THE sixth volume (new series) of the *Proceedings of the Aristotelian Society* contains the papers read before the society during its twenty-seventh session, 1905-6, and is unusually bulky, as publication has now become a much more important part than formerly of the society's work. Among other articles, it contains one on teleology by Dr. Shadworth H. Hodgson, the veteran ex-president of the society; a symposium “Can Logic abstract from the Psychological Conditions of Thinking?” to which contributions are made by Messrs. Schiller, Bosanquet, and Rashdall; and the records of a controversy (on Kantian and anti-Kantian lines) between Dr. G. Dawes Hicks and Prof. Stout. Scientific readers will turn with interest and profit to a paper by Mr. T. Percy Nunn, entitled “The Aims and Achievements of Scientific Method.” Mr. Nunn defines the aim of the scientific process as an endeavour to render the Objective in its actual determinations intelligible. He points out the stages of Animism and Hylozoism through which pre-scientific thought